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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/668,511	09/22/2003	Jayne L. Mershon	42P17198	1857

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Michael A. Bernadicou
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Seventh Floor
12400 Wilshire Boulevard
Los Angeles, CA 90025

EXAMINER

KALIVODA, CHRISTOPHER M

ART UNIT PAPER NUMBER

2883

DATE MAILED: 06/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/668,511

Applicant(s)

MERSHON ET AL.

Examiner

Christopher M. Kalivoda

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.

(b) CROSS-REFERENCE TO RELATED APPLICATIONS.

(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR
DEVELOPMENT.

(d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT

(e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A

COMPACT DISC (See 37 CFR 1.52(e)(5) and MPEP 608.05. Computer program listings (37 CFR 1.96(c)), "Sequence Listings" (37 CFR 1.821(c)), and tables having more than 50 pages of text are permitted to be submitted on compact discs.) or

REFERENCE TO A "MICROFICHE APPENDIX" (See MPEP § 608.05(a).

"Microfiche Appendices" were accepted by the Office until March 1, 2001.)

(f) BACKGROUND OF THE INVENTION.

- (1) Field of the Invention.
- (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
- (g) BRIEF SUMMARY OF THE INVENTION.
- (h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
- (i) DETAILED DESCRIPTION OF THE INVENTION.
- (j) CLAIM OR CLAIMS (commencing on a separate sheet).
- (k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
- (l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A

“Sequence Listing” is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required “Sequence Listing” is not submitted as an electronic document on compact disc).

Specifically, the “Brief Summary of the Invention” section is missing and the list of inventors should be removed from page 1 of the specification.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the second well with a depth greater than the first as recited in claim 6 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4, 5, 9, 10, 13, 14 and 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uchida et al., U.S. Patent Application Publication 2004/0042705.

Regarding independent claims 1, 9, 16, Uchida et al. teach a method or device comprising a circuit board (para 0024, lines 1-4 and Fig 1, ref sign 10) comprising:

- a surface (Fig 1, ref sign 12),

- a matrix material (Fig 1, ref sign 16, 18 and 20 and para 0015, lines 6-10),

- an embedded optical fiber (Fig 1, ref sign 30 and para 0025, lines 6-9),

- a first optical via for allowing light to travel through the matrix material between the surface and the embedded optical fiber (Fig 1, ref sign 24),

- a second optical via to allow light to travel through the matrix material between the surface and the embedded optical fiber (Fig 1, ref sign 50),

- a first optical redirector (Fig 1, ref sign 46 or another embodiment, Fig 2, ref sign M1) to redirect light received from the optical fiber along the first optical via toward the surface of the device and to redirect light received from the first optical via into the optical fiber,

- a second optical redirector (Fig 1, ref sign 66 or another embodiment, Fig 2, ref sign M1) to redirect light received from the optical fiber along the second optical via toward the surface of the device and to redirect light received from the second optical via into the optical fiber,

- a first optical component connected to the circuit board and optically connected to the first optical via (Fig 1, ref sign 36) to transmit optical signals along the first optical

via to the first optical redirector and to receive optical signals that travel up the first optical via from the first optical redirector,

a second optical component connected to the circuit board and optically connected to the second optical via (Fig 1, ref sign 52) to transmit optical signals along the second optical via to the second optical redirector and to receive optical signals that travel up the second optical via from the second optical redirector.

While the reference does not specifically state "a matrix material", the carrier sheet is fibrous and sandwiched between two other layers constituting a matrix material.

Regarding claim 2, the optical via comprises forming a well in matrix material of the PCB (Fig 1, ref sign 24 and 50 and para 0028, lines 11-13)

Regarding claims 4 and 13, there is an optically neutral material within the optical via and around the redirector (Fig 1, ref sign 64 and para 0026, lines 38-41).

Regarding claims 5 and 14, there is a light guide to direct light through the optically neutral material along the optical via (Fig 1, ref sign 36)

Regarding claim 10, the optical via's side walls (Fig 1, ref sign 28) define a boundary between the matrix material (Fig 1, ref sign 20) and optical via (Fig 1, ref sign 28).

Regarding claim 17, optical signals transmitted from the first optical component along the first optical via to the first optical redirector are redirected into the embedded optical fiber to the second optical redirector, which redirects the optical signals up the

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second optical via to be received by the second optical component (see light paths R1 and R2).

Regarding claim 18, the circuit board comprises a plurality of layers (Fig 1, ref sign 16, 18 and 20) and the embedded optical fiber (Fig 1, ref sign 30) is between a first and second layer of the plurality of layers (Fig 1, ref sign 30 is between ref sign 16 and 18).

Regarding claim 19, the circuit board comprises at least one layer, (Fig 1, ref sign 20) and the embedded optical fiber (Fig 1, ref sign 30) is within a first layer (Fig 1, ref sign 30 is in ref sign 20).

Claims 3, 6, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uchida et al., U.S. Patent Application Publication 2004/0042705 in view of Umebayashi et al., U.S. Patent Application Publication 2004/0091211.

Regarding claims 3, 6 and 11, Uchida et al. teaches the limitations of the claims as described above. There is a first well and a second well (via) as described above. In addition, the second well is deeper than the first well (Fig 1) exposing light transmissive surfaces.

However, the reference is silent with respect to forming a light-blocking layer on part of the sidewalls of a well.

Umebayashi et al. teach forming a light-blocking layer on part of the sidewalls of a well (Fig 2, ref sign 43).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Uchida et al. and include a light blocking layer on part of the side walls of a well.

The motivation for this improvement is to increase transmission efficiency (para 0035, lines 1-4).

Claims 7-8 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uchida et al., U.S. Patent Application Publication 2004/0042705 in view of Kilian, U.S. Patent Application Publication 2004/0101259.

Regarding claims 7 and 12, Uchida et al. teach the limitations of the claims as described above.

However, the reference is silent with respect to the redirector in the optical via attached to the printed circuit board with an adhesive.

Kilian et al. teaches coupling light into an optical fiber using a redirector; which is then secured with an adhesive (para 0059, lines 6-7).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Uchida et al and have the redirector attached to the PCB with an adhesive.

The motivation for fixing the redirector to the PCB with an adhesive is to fix the redirector in place after active alignment (para 0059, lines 5-6).

Regarding claim 8, Uchida et al. teach the limitations of the claims as described above.

However, the reference is silent with respect to directing light from a source into the optical via to the light redirector, redirecting, by the optical redirector the light from the source, detecting, with a light detector, light from the source that has traveled along the optical fiber after being redirected by the optical redirector, measuring the detected light, and changing the position of the optical redirector (i.e. active alignment).

Kilian et al. teaches active alignment by adjusting a mirror (para 0059, lines 5-6).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to direct light from a source into the optical via to the light redirector, redirect, by the optical redirector the light from the source, detect, with a light detector, light from the source that has traveled along the optical fiber after being redirected by the optical redirector, measure the detected light, and change the position of the optical redirector.

The motivation for performing active alignment on the device is to maximize light throughput.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uchida et al., U.S. Patent Application Publication 2004/0042705 in view of Umebayashi et al., U.S. Patent Application Publication 2004/0091211 and further in view of Kilian, U.S. Patent Application Publication 2004/0101259.

Regarding claim 15, Uchida teaches the limitations of the claims as described above. In addition, there is a light guide to direct light along the optical via as described above.

However, the reference is silent with respect to a layer of light blocking material on at least a part of the side walls of the optical via, attachment material for attaching the optical redirector to the device and optically neutral material that fills otherwise empty space within the via.

Umebayashi et al. teach forming a light-blocking layer on part of the sidewalls of an optical via (Fig 2, ref sign 43). Umebayashi et al. also teach an optically neutral material that fills an otherwise empty space in an optical via (para 0091, lines 8-10)

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Uchida et al. and include a light-blocking layer on part of the sidewalls of the optical via and include an optically neutral material that fills an otherwise empty space in an optical via.

The motivation for this improvement is to increase transmission efficiency by using a light-blocking layer (para 0035, lines 1-4). In addition, the motivation for using an optically neutral material in the via is to reduce outside stress on the device due to water (para 0040, lines 3-7).

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uchida et al., U.S. Patent Application Publication 2004/0042705 in view of Jiang et al., U.S. Patent 6,757,176.

Regarding claim 20, Uchida et al. teach the limitations of the claims as described above.

However, the reference is silent with respect to the matrix including a layer with a plurality of woven structural fibers and the embedded optical fiber woven with the structural fibers to form the layer.

Jiang et al. teach embedding a plurality of fibers woven in a core layer or matrix (col 1, lines 53-54).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Uchida et al. and include a plurality of woven structural fibers and have the embedded optical fiber woven with the structural fibers to form the layer.

The motivation for including a plurality of woven structural fibers is to increase the strength of the circuit board (col 1, lines 56-57).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 5,524,679 to Wiener describes weaving optical fibers.

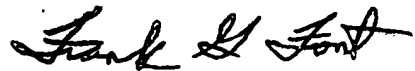
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher M. Kalivoda whose telephone number is (571) 272-2476. The examiner can normally be reached on Monday - Friday (8:30 - 5:00).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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Frank G. Font
Supervisory Patent Examiner
Technology Center 2800